UNIVERSITY OF NIŠ

Course Unit Descriptor	Faculty	Faculty of Mechanical Engineering

GENERAL INFORMATION			
Study Program	Traffic engineering, transport and logistics		
Study Module (if applicable)	-		
Course Title	Structural dynamics of transport machines		
Level of Study	☐Bachelor	☒ Master's	☐ Doctoral
Type of Course	☐ Obligatory	☒ Elective	
Semester	☒ Autumn	☐ Spring	
Year of Study	I		
Number of ECTS Allocated	6		
Name of Lecturer/Lecturers	Dragan Z. Marinković		
Teaching Mode	☒ Lectures	☐ Group tutorials	☐ Individual tutorials
	☒ Laboratory work	☒ Project work	☒ Seminar
	☐ Distance learning	☐ Blended learning	☐ Other

Purpose and Overview (max. 5 sentences)

Acquainting students with the needs for dynamic analysis in the field of transport technique and with the basic numerical algorithms for structural dynamics, determination of structural parameters that influence dynamic behaviour, comprehension of the difference between numerical algorithms and adequate choice of algorithms for specific cases of dynamic behaviour, model reduction for an efficient dynamic analysis.

Students gain knowledge necessary to perform efficient dynamic analysis of transport machines but also changes in the design so as to improve dynamic structural behaviour with respect to the pre-defined criteria.

Syllabus (brief outline and summary of topics, max. 10 sentences)

1) The basic equation of structural dynamics – understanding dynamic response based on a simple structure with one degree of freedom, damped and undamped oscillations, harmonic excitation. 2) Complex structures – time and material discretization, FEM structural discretization, stiffness matrix, mass matrix, damping matrix, load vector. Discretization in time domain – incremental approach. 3) Modal analysis – significance, the eigenvalue problem, algorithms, eigenfrequences and modes, influence of damping, transport technique examples. 4) Structural damping – causes of energy dissipation, determination of structural damping, mathematical description. 5) Direct integration of dynamic equation – explicit and implicit algorithms, their comparison, criteria for the choice of adequate algorithm in the field of transport technique, examples. 6) Modal superposition – model reduction based on modal space, modal factors, criteria for the choice of modes, Craig-Bampton reduction, transport technique examples. 7) MBS (multi-body system dynamics) approach to resolve dynamic behaviour of a system of interconnected rigid bodies, formalisms for inclusion of elastic behaviour.

Language of Instruction

☒Serbian (complete course) ☐ English (complete course) ☐ Other _____ (complete course) ☒Serbian with English mentoring ☐Serbian with other mentoring _____			
Assessment Methods and Criteria			
Pre exam Duties	**Points**	**Final Exam**	**Points**
Activity During Lectures	**10**	**Written Examination**	**60****
Practical Teaching	**0**	**Oral Examination**	**30**
Teaching Colloquia	**60**	**Overall Sum**	**100**
Final examination mark is formed in accordance with the Institutional documents** * If not earned in teaching colloquia**			